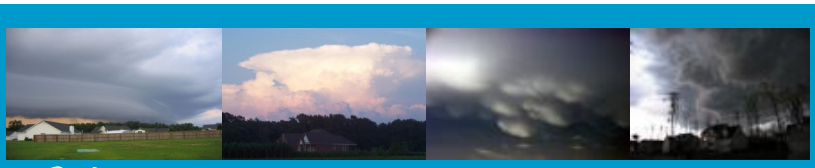


Changing Skies
Over Central North Carolina

VOLUME 7, ISSUE 3 FALL/WINTER 2010
NOAA'S NATIONAL WEATHER SERVICE RALEIGH, NC

INSIDE THIS ISSUE:

Will La Niña Deliver Mild Winter?

Forecasts of an intensifying La Niña episode in the Pacific have resulted in predictions of better than normal chances that the mid-Atlantic will experience a warmer and drier than normal winter. It is true that La Niña can have dramatic effects on the flow of the jet stream, which greatly influences our weather. Local research has shown that during La Niña winter episodes, when the equatorial Pacific Ocean is colder than normal, 67-73% of those winters have resulted in below normal precipitation across central NC. Only 8-18% of those winters experienced above normal precipitation. The reason for the pronounced drier signal is due to a shift in the jet stream.

During La Niña winters the southern stream of the upper jet stream is weakened and the polar jet which drives winter storms shifts further north. This northerly shift in the polar jet stream typically allows NC winters to be warmer and drier than normal, typically resulting in less storminess. That said, this in no way means no winter storms.

Think back to January 2000. There had been a couple of winter storm teasers in early January, but overall the season had been quiet. Temperatures and precipitation had been running around normal and no major storm systems had impacts the region. All that changed on January 25th when a low pressure system rapidly intensified as it tracked from the Georgia coast to Cape Hatteras. The

(continued on page 7)

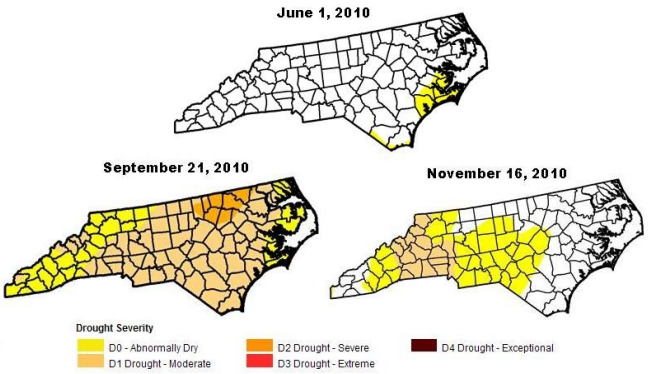
NOAA's 2010-2011 Winter Outlook

Sultry Summer Brings Record Temps and Drought

Record Temps

The 2010 climatological summer (June, July, and August) was by far the warmest on record at both the Raleigh-Durham International Airport (RDU) and the Piedmont Triad International Airport (GSO). For the three-month period, RDU averaged 81.7 degrees, breaking the old record of 79.8 degrees from 2007. Likewise, GSO averaged 80.1 degrees, eclipsing the old record of 78.5 degrees recorded in 2007 and 1993. June, in particular, was abnormally warm, with average temperatures of 6 to 7 degrees above normal across all of central North Carolina.

"The 2010 climatological summer (June, July, and August) was by far the warmest on record."



Radar Imagery from 2000 Winter Storm

Summary of the number of record high temperatures set per month (Red) and the number of record high minimum temperatures (Black) at RDU and GSO:

	May	June	July	Aug	Sep	Oct
RDU	4 / 2	1 / 7	3 / 6	1 / 2	8 / 0	5 / 3
GSO	1 / 0	0 / 5	1 / 10	1 / 4	1 / 2	1 / 3

This record breaking climatological summer was due not only to a large number of very hot days, but also a result of warm nights. In fact, high temperatures which either tied or exceeded records for the date were recorded at RDU on 5 days, and at GSO on only 2 days during the period. High minimum (overnight low) temperature records were tied or exceeded on 15 days at RDU, and on 20 days at GSO. As summer waned, unusually warm conditions prevailed through September and the first 3 weeks of October.

Regarding the 2010 high temperatures on a yearly basis, thus far (and it's highly unlikely we'll see 90 again this year), RDU recorded 91 days where the high temperature reached or exceeded 90 degrees. This breaks the old record of 83 days set in 2007. GSO recorded 67 days with a high temperature of 90 or greater, breaking the old record of 63 days which was also set in 2007.

Drought Edges In

Rainfall was near normal early in 2010, and only small areas along the coast were designated as suffering from abnormally dry (D0 drought conditions) early in the climatological summer. Rainfall across central NC was somewhat, but not alarmingly, below normal through the summer, but evaporation rates were much higher due to the abnormally warm temperatures. This led to drought slowly creeping into central NC over the summer, and worsening as we headed into the fall. Drought reached its peak in late September, with moderate drought conditions across all of central NC, and severe drought conditions northeast of the Triangle area.

Tropical cyclones account for as much as 25 percent of the rainfall NC receives during the fall. While North Carolina was not hit directly by a tropical cyclone in 2010, a tropical plume of moisture set up along the Atlantic coast in late September. Further south, Tropical Storm Nicole was absorbed into this plume and steered north along the east coast. This resulted in a widespread heavy rain

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Quiet Tropical Season For North Carolina

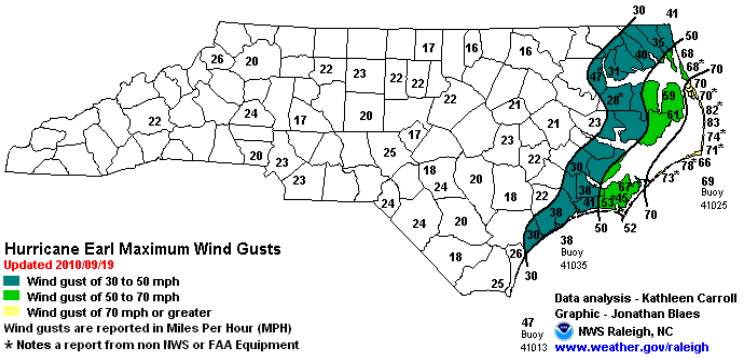
Although hurricane season doesn't officially end until November 30th, thus far it has been a fairly uneventful one for North Carolina residents. It has still been considered an active year as to date there have been 19 named storms and 12 hurricanes. Two of these storms Hurricane Earl, and the remnants of Tropical Storm Nicole had impacts on North Carolina.

For a while, it looked like Earl may have severe impacts on the outer banks as residents rushed to board up their homes and businesses and evacuate inland. Originally it appeared that the track of Earl would re-curve and head out to sea well to the east of Cape Hatteras. As the storm barreled through the Caribbean Sea, the track began to gradually shift westward. On August 31st at 5pm, the Outer Banks were well within the 3 day cone of uncertainty and a Hurricane Watch was hoisted. By 11am on September 1st, the watch had turned into a warning. Earl never did make landfall on the coast but winds in the outer rainbands that did make it to shore measured as high as 83 mph. Meanwhile heavy rains and surf pounded the coast, causing roads to wash out and beaches to erode. The coast suffered minor damage but residents realize how bad it could have been if the storm had tracked just a little bit further west.

Satellite Picture of Hurricane Earl

Earl wasn't the only show in town this summer. The remnants of Tropical Storm Nicole helped to set up a heavy rain event over central North Carolina, which helped to mitigate a developing drought in the region. Details regarding Nicole and the drought can be found in this issue's article "Sultry Summer Brings Record Temps and Drought" beginning on page 2.

-Ryan Ellis



Maximum Wind Gusts Observed During Hurricane Earl

NWS Celebrates Native American Heritage Month

November is Native American Heritage Month and we here at WFO Raleigh are lucky enough to have employees with Native American bloodlines on our staff. Karl Lenzen is one such employee whose heritage has led him to explore this unique culture in great detail. Throughout the month Karl will be sharing items from his personal collection of Native American artifacts dating back hundreds of years with the staff. A sampling of items on display is pictured on the right. **-Ryan Ellis**

Don't Get Caught in the Cold!

Last winter season saw record breaking snowfall totals across portions of North Carolina, so does this mean we will "catch a break" this year, with a mild winter? While predictions are calling for better chances of a drier and warmer than normal winter, there is still uncertainty. We should still do our part to prepare. One good practice is to keep up with the latest conditions and forecasts from the National Weather Service. If a light accumulation of freezing rain or sleet is forecast, or if snow accumulations of 1 to 2 inches are expected, the NWS will issue a Winter Weather Advisory. If a quarter of an inch of freezing rain, a half-inch of sleet, and/or 3 or more inches of snow is expected, Winter Storm Watches and Warnings are issued. In order to provide as much planning time as possible, Watches can be issued as much as 48 hours in advance. Warnings are issued when the dangerous weather is highly likely or imminent within the next 24 hours.

Winter Storm Watch/Warning	3+" Snow accumulation	½" Sleet ¼" Freezing rain	hazards judged to pose a threat to life and property within 24 hours.
Winter Weather Advisory	1-2" Snow accumulation	Any accretion of sleet / freezing rain	hazards cause a significant inconvenience and warrant extra caution.
Blizzard Warning	Sustained or frequent gusts > or = 35 mph *AND* considerable blowing/drifting of snow reducing visibilities frequently < 1/4 mile		
Wind Chill Advisory	0° F or less with wind speeds 10 mph or more.		
Wind Chill Warning	-15° F or less wind speeds 10 mph or more.		

For a complete listing of all NWS Watch, Warning and Advisory Criteria please visit; http://www.erh.noaa.gov/rah/criteria/

Anyone who has been in North Carolina for more than a couple of years knows that ice is our most dangerous winter weather threat. Significant accumulations of ice, in the form of freezing rain, bring down trees, power lines and telephone poles. Power and communications services can be disrupted for weeks, as many residents experienced during the ice storm of December 2002 when millions from the Triangle to the mountains lost power.

Heavy snow is also no stranger to the area. The snow storm of January 2000 is still a vivid memory in the minds of most Triangle residents. During this storm, 18 to 24 inches of snow fell in less than 24 hours resulting in one of the snowiest winters on record.

Most deaths attributed to winter storms result from indirect dangers such as traffic accidents, falling trees, downed power lines, house fires and carbon monoxide poisoning resulting from improper indoor use of heat sources such as grills, stoves, and space heaters.

Also, make sure there is enough of the right type of fuel for alternative heat sources such as fireplaces, wood stoves, and space heaters. If you use a space heater, make sure it is in good working order with no loose wires or missing parts. Make sure it is stable, away from curtains or other flammable materials, in a place where it won't be knocked over. Never use charcoal or gas grills indoors as a source of heat, as carbon monoxide build-ups are deadly.

Is Your Home Prepared for Winter?

We think of our homes as the place we want to be when the weather turns cold and blustery. However, if certain precautions are not taken before a winter storm strikes, life at home can be just as miserable as the weather outside.

Do- stock an emergency supply of food and water prior to the onset of a winter storm. Include food items which require no cooking such as canned meats...peanut butter and other non perishables. Also do not forget to have necessary medicines and baby items on hand. A three to five day supply of food and medicine is generally sufficient. Also make sure you have a manual can opener.

Do- Keep an adequate supply of heating fuel (firewood, kerosene, etc.) at your home. Use your fuel sparingly as supplies may be in short order during winter storms. Use heaters and fuels properly and safely in order to avoid deadly fires and carbon monoxide.

Do- Conserve fuel by keeping your house cooler than usual and by temporarily "closing off" heat to some rooms.

Do- When kerosene heaters are used, maintain ventilation to avoid the build up of toxic fumes. Also, always refuel kerosene heaters outside and keep them at least 3 feet away from flammable objects. Use only approved fuel in these heaters. NEVER burn gasoline.

Do- Keep fire extinguishers on hand, and make sure your family knows how to use them. Know fire prevention rules.

Do- Keep on hand a flash light, battery powered radio, extra batteries and a first aid kit.

Do- Prevent water pipes from freezing by wrapping them with insulation or newspaper covered with plastic. In really cold weather, let your faucets drip slightly to help avoid freezing. If your pipes do freeze, remove the insulation and wrap the pipes in rags. Open every faucet in the house and pour hot water over the rag wrapped pipes. Also know how to shut off your homes water supply should water lines break.

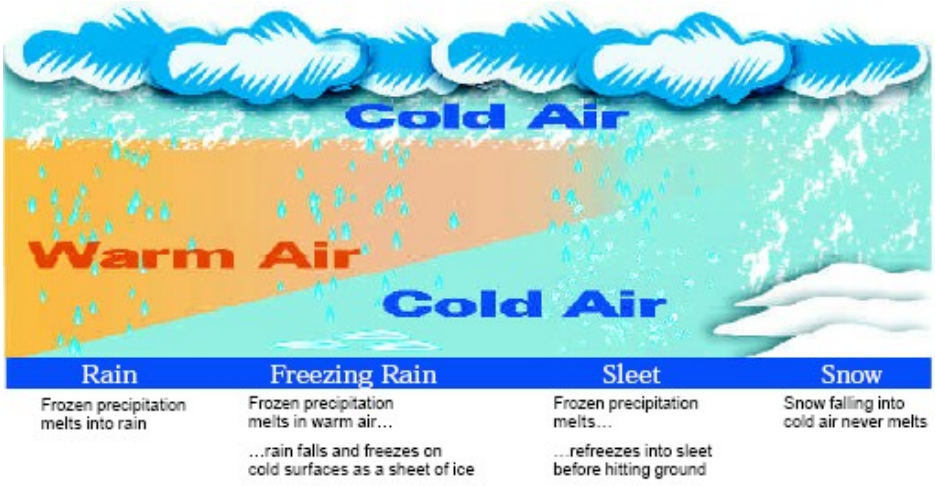
Do- Keep generators well

away from the home. Never run a generator in your garage of any other enclosed area. Carbon monoxide from the exhaust of the generator can be a silent killer. Also make sure your generator is properly wired to your home.
Do- Make sure that every family member knows how to evacuate the house in the event of a fire. Make sure you and your family designate an outdoor meeting place if you do have to leave your home quickly because of a fire.

Never- heat your home using a charcoal grill...gas grill or camp stove. Grills and camp stoves create deadly carbon monoxide fumes that will build up when used in your home. Always use grills outside.

Driving in Winter Weather

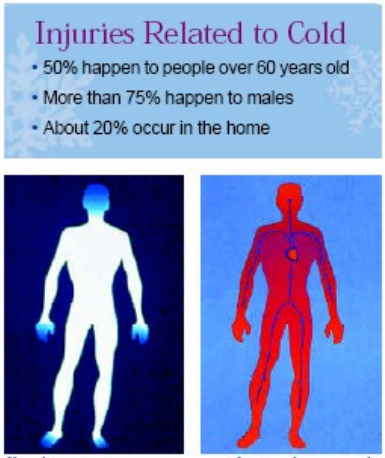
We all know how hazardous driving can be when ice and snow are on the ground. 75 percent of all winter weather related deaths occur on the road, either in accidents or people becoming stranded. Obviously, when the weather is bad and driving conditions
are poor, the best bet is to stay at home. However, if your must venture out, the following tips could make for a safer journey.
Make sure your car is in good running condition. Make sure that your battery, antifreeze, windshield wipers, ignition and thermostat are all in good working order. Be sure your tires have enough tread. Replace any of these items if necessary.
Do- If you must go out when snow and ice are on the ground, let someone know your destination and when you plan to arrive.
Do- Clean snow and ice off all parts of your car before you drive away.
Do- Keep your gas tank as full as possible. This will not only give you added peace of mind, it also increases the weight of your car and this will provide additional traction.



Do- keep the following basic items in your car; windshield scraper and brush, jumper cables, a tow chain or rope, bag of sand or salt, a blanket, flashlight, first aid kit and road map.
Do- If you do begin to slide, take your foot off the gas and turn the steering wheel IN THE DIRECTION OF THE SLIDE. DO NOT apply the brakes as that will cause further loss of control of the car.

If you get stranded on the road stay in your car.

Do not seek shelter or a telephone unless they are close by or already visible. You can easily become disoriented in heavy snow and frigid temperatures.
Do- Set your directional lights to "flashing" and hang a cloth or distress flag from the radio aerial or window. In a rural or wilderness area, spread a large cloth over the snow to attract attention of rescue crews who may be surveying the area by airplane.
Do– Periodically turn on the car engine for brief periods. This will help provide heat inside the car. However, to avoid carbon monoxide gas buildup, clear the exhaust pipe of snow and leave a downwind window slightly open for ventilation.
Do– Make yourself visible by tying a colored cloth to your antenna or door, or by turning on your dome light when running the engine.
Do- Be careful not to use battery power. Balance electrical energy needs, the use of lights, heat and radio, with your supply.



Hypothermia occurs when the extremities are excessively cold (blue)

Improperly warming the body will drive cold blood from the extremities to the heart, leading to heart failure

You can keep up with winter forecasts, warnings and advisories by visiting the Raleigh NWS online at http://weather.gov/raleigh. Winter weather preparedness information from the North Carolina Division of Emergency Management can be found on the Internet at http://www.ncready.org/. For the latest road conditions and access to web cameras statewide, visit the Department of Transportation online at http://tims.ncdot.gov/tims/. For more winter weather safety tips, visit http://www.nws.noaa.gov/om/winter/.

All of us in the National Weather Service wish you a safe winter season!
-Jeff Orrock

Multi-Year CSTAR Project to Examine Critical Forecast Challenges

CSTAR Working Group from October 28-29 collaborative meeting in Raleigh

"The research is aimed to help forecasters with three forecast challenges that affect the region."

On October 28th and 29th over 30 meteorologists from the National Weather Service (NWS) as well as faculty and students from NC State University (NCSU) gathered in Raleigh to begin implementation of a 3 year Collaborative Science, Technology, and Applied Research (CSTAR) project. This is the fourth such CSTAR project awarded to support collaborations between NCSU and NWS offices in the Carolinas and Virginia. Previous CSTAR projects have examined the roll of cold air damming and costal fronts, cold season quantitative precipitation forecasts, and improving the prediction of warm season precipitation systems in the Southeast and Mid-Atlantic.

After evaluating input from NWS forecasters that identified critical forecast problems across the region, a proposal submitted by NCSU researchers was awarded for a project entitled "Improving Understanding and Prediction of Hazardous Weather in the Southeastern United States: Landfalling Tropical Cyclones and Convective Storms." The research is aimed to help forecasters with three forecast challenges that affect the region: prediction of heavy precipitation and localized flooding associated with tropical cyclones, prediction of coastal and inland tropical cyclone winds, and the prediction of convective storms forming under conditions of marginal instability and strong vertical wind shear.

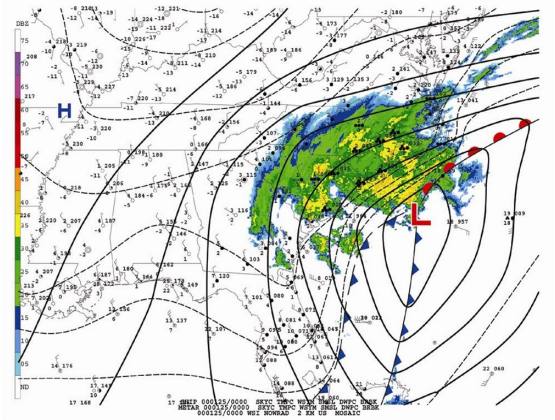
Project collaborators include NC State University, 10 NWS Weather Forecast Offices across the Southeast stretching from Washington D.C.-Baltimore, MD south to Peachtree City, GA as well as the Storm Prediction Center, the Hydrometeorological Prediction Center, the Tropical Prediction Center, the Earth System Research Laboratory Global Systems Division, and the Renaissance Computing Institute. Project updates and other NWS-NCSU collaboration activities are available on the NWS-NCSU Collaboration web page and the Collaboration for Improved Meteorology in the Mid-Atlantic and Southeast (CIMMSE) blog.

-Jonathan Blaes

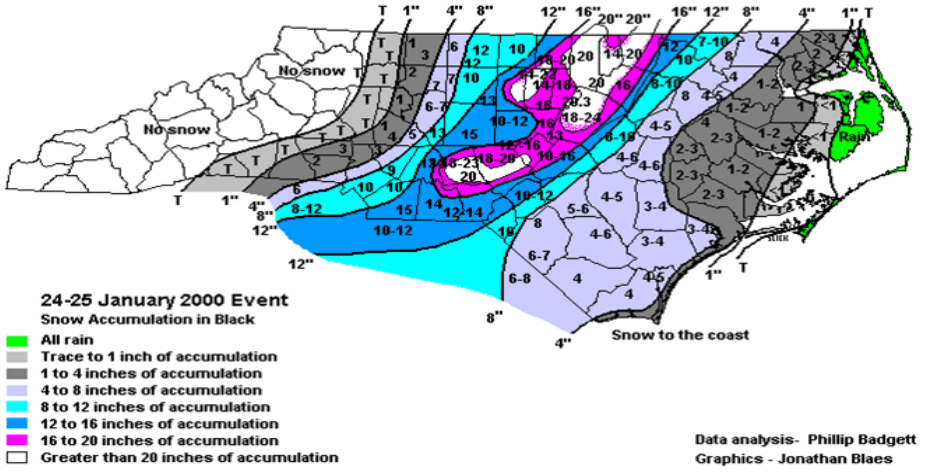
Winter Outlook (continued from page 1)

low pressure system became what is known as a "bomb" as pressure plummeted and the storm intensity increased. As the storm exploded it rapidly tracked from the Georgia coast to the North Carolina coast in as little as 10 hours. The 2000 winter was also a La Niña winter which saw the areas greatest snowfall on record to date. Just because predictions are for a continuing La Niña and better chances that the winter will be warmer and drier than normal it does not mean no snow. Major winter storms are a possibility in any winter. To make matters worse the La Niña winter weather pattern usually means storms systems that do develop and intensify along the east coast will typically go through their development process over the mid-Atlantic instead of further south along the Gulf Coast. The reason for this is the northern position of the jet stream which is in part responsible for developing and intensifying winter storms. The northward shift in the jet stream means winter storms which do develop will likely form directly over our heads making forecasting these winter storms more difficult for forecasters in the Carolinas and Virginia. This is in contrast to last winter when many of the winter storms which brought snow to the area developed over the Gulf Coast and then tracked along our coast. The bottom line is the La Niña winter weather pattern can make winter events more difficult to forecast due to the lack of deep cold air and well defined storm systems. The lack of deep cold air can also result in an increase of more wintry mixed events including freezing rain.

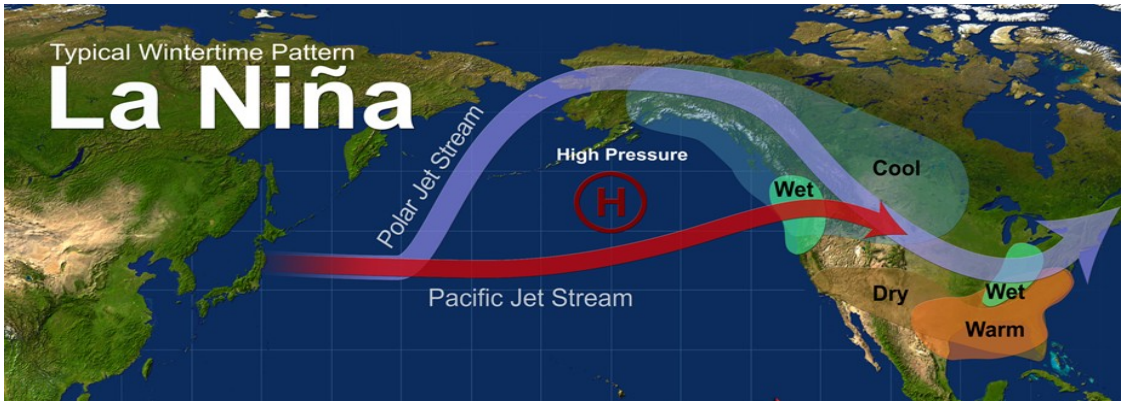
-Jeff Orrock



Radar Imagery from 2000 Winter Storm



Snowfall Totals Across North Carolina During the 2000 Winter Storm



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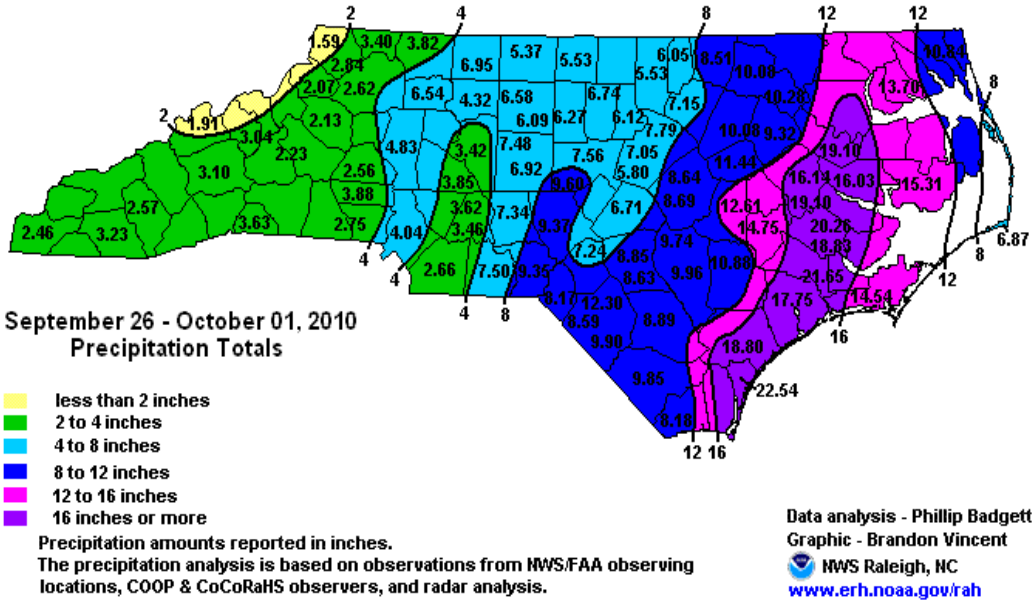
Drought (continued from page 2)

east coast. This resulted in a widespread heavy rain event which dumped several months' worth of rain on eastern and central NC over a 4 day period. This much rain would normally have caused moderate to major flooding. Only very minor flooding resulted, however, due to extremely dry soil and low stream and lake conditions. Not surprisingly, this one event eliminated drought conditions in eastern NC, and greatly alleviated drought conditions over central NC.

-Mike Moneypenny



Rainfall Totals Associated with the Remnants of Tropical Storm Nicole

"Not surprisingly, this one event eliminated drought conditions in eastern NC, and greatly alleviated drought conditions over central NC."